TOSHIBA
STORAGE DEVICE DIVISION

SR-C8002
CD-R/CD-RW DRIVE
PRODUCT SPECIFICATION

MAY 2001
REV. 1.0

Specifications are subject to change without notice

DOCUMENT NUMBER
14708

LIMITATION OF LIABILITY

Those warranties in the express warranty separately agreed between TOSHIBA and your company are the only warranties given to the consumer and are in lieu of any other warranties, whether express or implied with regard to this component. TOSHIBA expressly and unequivocally disclaims the warranties of merchantability and fitness for a particular purpose.

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TOSHIBA will not be responsible for any damages, whether compensatory, incidental, consequential, or special damages of any kind, including but not limited to, punitive or exemplary damages, treble damages, loss of use or lost profits whether such damages are sought by the end-user or the purchaser herein, regardless of whether such liability is sought directly or by way of indemnity proceedings in law or equity.

It shall be the responsibility of the purchaser herein to provide the end-user or ultimate consumer with all product documentation provided with this product including all product specification, manuals, registration forms and warranty information including product capabilities and limitations. By accepting the component(s), the purchaser herein below agrees to do so and further accepts the terms of this limitation. The purchaser herein below expressly waives any and all rights to the contrary.

Warnings:

This equipment (an optical disc drive) handled under the conditions out of equipment specifications may cause heavy load, heat generation, malfunction, erroneous operation and performance degradation. Therefore, please handle this equipment properly in compliance with the warnings provided below. In the event that you do not comply with the warnings, Toshiba cannot guarantee the safety, reliability and performance of the equipment expressly provided in the specification. Manufacturers and resellers of the computer system using this equipment and/or this equipment itself shall notify the end-users of the warnings provided herein and ensure them to comply with these warnings in an appropriate manner.

1. This equipment does not involve any over-current protection circuit. Use an appropriate over-current protection in the computer system which this equipment would be connected. Toshiba shall not be liable for any damages to the system which does not have any over-current protection.

2. **DO NOT** disassemble or modify this equipment. Toshiba shall not make any guarantee to the reliability, safety and performance of this equipment expressly provided in the specification and nor be liable for any damages resulting from such unauthorized disassembly or modification.

3. Read carefully and comply with this Product Specification in order to avoid the risk of data error in writing operation. Such possible data error would be made by any factors other than this equipment (i.e., poor storage media, misuse of this equipment, malfunction in a computer system connecting this equipment, etc.). Toshiba shall not be liable for any damages resulting from such data loss. Check whether the original data is correctly copied or stored upon completion of writing operation.
   Take any necessary measures to protect your data such as system backup and/or mirroring disk subsystems in order to avoid the risk of unexpected data loss or data corruption resulting from failure in this equipment for some reasons.

   Manufacturers and resellers of the computer system using this equipment shall be required to consider the safety of such computer system and data integrity in order to avoid the risk of any consequential damages caused by data loss or data corruption and any problems or accident caused by malfunction of the computer system.

DO NOT use this equipment in the system such as medical equipment which may cause personal injury or property damages resulting from malfunction of this equipment and unexpected data corruption or data error in reading operation.

4. Turn off the power for this equipment and wait more than one (1) minute before you eject the disc using the emergency eject mechanism when a disc cannot be ejected for some reasons in order to avoid the risk of damages to the disc.

Notice

1. Turn off the system power before mounting/removing this equipment in order to avoid the risk of damages to this equipment.

2. Insert the DC power plug in correct direction in order to avoid the risk of damages to this equipment.

3. Handle this equipment only in electrostatically safe environment and **do not** touch connecting terminals with empty hands when you build in or pull out this equipment from other product in order to avoid the risk of malfunction of this equipment.

4. **DO NOT** do any of the following:
   - 4.1. **DO NOT** use storage media (CD's / DVD's) that are not the correct size or shape, or **do not** meet the minimum formatting requirements set forth in section 3.1.(1) of this Product Specification.
   - 4.2. **DO NOT** insert more than one (1) CD or DVD disc into the drive at any time. Doing so will damage or destroy this equipment and could damage or destroy the disc or cause data loss or corruption.
   - 4.3. **DO NOT** load or eject any CD or DVD disc with force. Doing so will damage or destroy this equipment and could damage or destroy the disc or cause data loss or destruction.
   - 4.4. **DO NOT** give a strong shock while load or eject operation is in process. Doing so will damage or destroy this equipment and could damage or destroy the disc or cause data loss or corruption.
   - 4.5. **DO NOT** eject a CD or DVD disc while the drive is in operation. Doing so will damage or destroy this equipment and could damage or destroy the disc or cause data loss or corruption.
   - 4.6. **DO NOT** insert anything else into the drive other than a CD or DVD disc. Doing so will damage or destroy this equipment.

----- **To OEM Customers:** --

Please notify below notice to your customers.

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Contents

1. Introduction

This document describes TOSHIBA's SR-C8002 CD-R/RW Drive.

2. Features

SR-C8002 reads digital data stored on CD-ROM media and CD-Audio discs.

The CD-ROM media has a 12 cm or 8 cm diameter. It typically contains approximately 600 MBytes or 200 MBytes of information respectively. (1 MByte=2^{20} Bytes)

This drive reads CD-ROM media at maximum 24 times faster rotational speed.

This drive is a new generation drive with highest performance such as 120 ms access Time.

This drive writes CD-R/RW media at maximum 8 time faster rotational speed.

This drive shows highest performance such as 60,000 hour MTBF.

This drive offer long life and high durability because the disc is read by a LASER, thereby eliminating physical contact with the disc.

This drive support ATAPI (ATA Packet interface) Revision 2.6 spec. and SFF8090 Version 3 (Mt. Fuji Commands for CD Devices) of CD Command.

3. Specifications

3.1.Performance

(1) Applicable Write Format CD-R/RW:	Disc at once, Track at once, Session at once, Packet write
(2) Applicable Write Disc *[1] CD-R/RW:	CD-DA, CD+(E)G, CD-MIDI, CD-ROM,CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video-CD) Multisession CD (Photo-CD, CD-EXTRA, Portfolio)
(3) Applicable Read Disc *[2]	CD : CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, , CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video-CD) Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW
(4) Data Capacity	
User Data/Block	Mode-1: 2,048 Byte/Block Mode-2: 2,336 Byte/Block
Data Cpacity/Disc	Mode-1: 656.5 MB (688.4 Million Byte) *[3] Mode-2: 748.8 MB (785.2 Million Byte) *[3] (1 GB=2^{30} Byte, 1 MB=2^{20} Byte, 1 KB=2^{10} Byte)
(5) Rotational Speed	
Read: ROM Data Media	: Approx. 5,100 rpm (10.3-24X CAV)
CD-DA, Video-CD	: Approx. 1,290-2,000 rpm (4-6X PCAV)
CD-RW	: Approx. 1,290-2,000 rpm (4-6X PCAV)
Hight Speed CD-RW	: Approx. 2,570-4,000 rpm (8-12X PCAV)
Write: CD-R, High speed CD-RW	: Approx. 1,700-3,960 rpm (8X CLV)
CD-RW	: Approx. 850-1.980 rpm (4X CLV)

(6) Transfer Rate

Sustained Block Transfer Rate

776-1,800 Block/s (10.3-24X CAV)
300-450 Block/s (4-6X PCAV)

Sustained Data Transfer Rate

Mode-1: 10.3X-24X CAV 1,552-3,600 KByte/s
4X-6X PCAV 600-900 KByte/s

Mode-2: 10.3X-24X CAV 1,769-4,104 KByte/s
4X-6X PACV 684.4-1,026.6 KByte/s

Burst Data transfer Rate

16.7 MByte/s (PIO Mode 4)
16.7 MByte/s (Multi word DMA transfer mode-2)

(1 KByte=2^{10} Byte=1,024 Bytes, 1 MByte=2^{20} Byte=1,048,576 Bytes)

(7) Access Time

Average Random Access Time*4 120 ms Typ (10.3-24X)

Average Random Seek Time*5 105 ms Typ (10.3-24X)

Average Full Stroke Access Time*6 170 ms Typ (10.3-24X)

(8) Spin up Time (Focus Search Time and Disc Motor Start up Time)
2.0 s Typ (10.3-24X)

(9) Data Buffer Capacity 2 MByte

*1: This drive write the data on the disc of CD-R, CD-RW format. However, in order to run applications that use these formats you must first have the required software and/or hardware.
*2: All disc written in CD formats, except CD-DA (audio), require additional specific application software and/or hardware. This drive referred in the specification is capable of reading these data formats. However, in order to run applications that use these formats you must first have the required software and/or hardware.
*3: Data capacity when recording depends on the condition of the record and decreases from this occasionally.
*4: Measured by performing multiple accesses which means reads of data blocks over whole area of the media from 00 min 02 sec 00 Frame to 60 min 01 sec 74 Frame (552.96 Million Byte:87 % of total area at linear velocity of 1.3 m/s) more than 3000 times. Includes positioning, setting, latency time and ECC implementation time (if required).
*5: Measured by performing multiple seek which means seeks of data block over whole area of the media from 00 min 02 sec 00 Frame to 60 min 01 sec 74 Frame more than 3000 times. Includes positioning, setting time which is same definition as HDD.
*6: Measured by performing maximum accesses which means reads of each data block of 00 min 02 sec 00 Frame and 60 min 01 sec 74 Frame alternately more than 100 times.
Includes positioning, setting, latency time and ECC implementation time (if required)

(10) Drawer Load/Release	Load:	Manual
	Release:	(a) Electrical Release (Release Button)
		(b) Release by ATAPI command
		(c) Emergency Release
(11) Air Flow		Not Required
(12) Acoustic Noise		40 dB (IEC 179 A weighted at 1 m)
(13) Power Supply		+5 V (details in Section 7)

3.2. Environmental Conditions

This drive should be used under the conditions listed below.

3.2.1.Temperature and Humidity

(1) Operating Temperature	5 °C to 50 °C *1
(2) Storage Temperature	-10 °C to 60 °C
(3) Shipping Temperature	-40 °C to 65 °C *2
(4) Operating Temperature Gradient	11 °C/hour (max)
(5) Storage Temperature Gradient	20 °C/hour (max)
(6) Shipping Temperature Gradient	20 °C/hour (max) *2
(7) Operating Humidity	8 % to 80 %
(8) Storage Humidity	5 % to 95 %
(9) Shipping Humidity	5 % to 95 % *2
(10) Wet bulb Maximum Temperature	27 °C
(11) Condensation	In all the above conditions there must be no condensation

*1: Except for disc

*2: Packed in Toshiba original shipping package.

3.2.2.Dust and Dirt unspecified

3.2.3.Vibration

(1) Operating (CD 10.3-24X Read) (1 Oct/min) ---------------- no hard error -----
5 to 500 Hz 2.45 m/s^2 [0.25 G] (0-p)
(excluding resonance point)

(2) Operating (Write) (1 Oct/min) ---------------- no hard error -----
5 to 500 Hz 2.45 m/s^2 [0.25 G] (0-p)
(excluding resonance point)

(3) Non-operating (1 Oct/min) --------- no damage -----
5 to 10 Hz 5 mm (p-p)
10 to 500 Hz 9.8 m/s^2 [1 G] (0-p)

(4) Shipping (Packaged) (1 Oct/min) ----- no damage -----
10 to 25 Hz 9.8 m/s^2 [1G] (0-p) X Y Z/30 min each

3.2.4.Atmospheric Pressure and Altitude

(1) Operating 0 to 3,000 m
(2) Shipping 0 to 12,000 m

3.2.5.Shock

(1) Operating (Read) ------------------- no hard error ---------------
14.7 m/s^2 [1.5 G] (Horizontal)
(Half sine wave 11 ms/10 s interval)

----------------------- no data loss --------------
98 m/s^2 [10 G]
(Half sine wave 11 ms/10 s interval)

(2) Operating (Write) ----------------------- no error --------------
14.7 m/s^2 [1.5 G] (Horizontal)
7.8 m/s^2 [0.8 G] (Vertical)
(Half sine wave 11 ms/10 s interval)

(3) Non-operating (with no Disc mounted) ----- no damage -----
490 m/s^2 [50 G] (Half sine wave 11 ms)
980 m/s^2 [100 G] (Half sine wave 3 ms)

(4) Drop (Packaged) ------------------ no damage -----
(a) Bulk Package (50 pcs) 1 drop at 0.4 m (Bottom side only)
(b) Bulk Package (20 pcs) 0.6 m drops once for each 6-surface, 1-edge and 1-corner

3.3. Installation Conditions

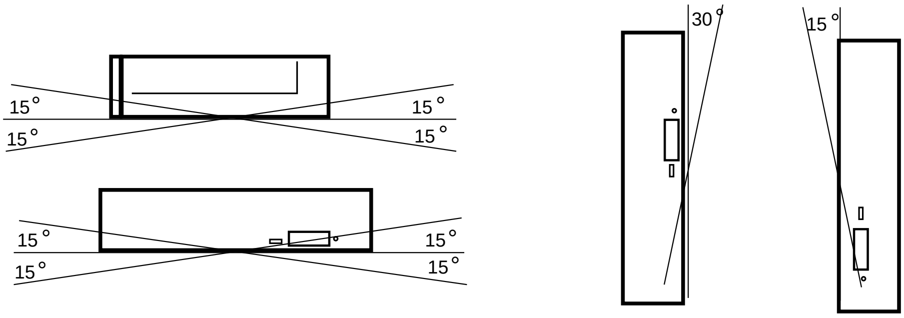


Figure 1 Mounting angle

3.3.1. Equipment

(1) When mounting the equipment, use four M2-P0.4 tapping holes located on the left and right sides of the equipment.

(2) The opposite surface of the bearing surface (fitting surface when mounting) of the tapping holes must be kept flat so that the bearing surface can be fit evenly.

(3) Use the mounting screws which do not enter deeply inside the equipment more than specified value.

(4) When mounting the equipment, the tightening torque of four screws must be even.
The recommended screw tightening torque is 0.2 Nm.

3.3.2.Installation

(1) The mounting surface of the equipment must keep good flatness.
When mounting, care should be paid that an excessive force which may caused torsional distortion on the equipment does not apply to the equipment. The recommended surface flatness for the mounting surface should be less than 0.2 mm.

(2) Install the equipment with enough space as much as possible in all directions around the equipment. Care should be paid that the equipment does not touch with peripheral instruments even if vibration, mechanical shock, etc. are applied to the equipment.
For the maximum dimension of the equipment thickness (12.9 mm), it is recommended that a clearance more than 0.5 mm should be left the thickness direction.
For the clearance around the front bezel, it is recommended that the clearance more than 0.8 mm should be left in all directions.

(3) Care should be especially paid for the heat effect. Keep the air ventilation and isolate from heat of the environmental condition. Then, install the equipment where the environmental temperature at the bottom center of cabinet does not exceed 50 °C.

(4) Do not add the force beyond the indicated force on the top and bottom cover of the equipment. (The restricted force range for the top cover is shown in the Figure 2.) (For the bottom cover, the applied force should be less than 2N on whole area.)

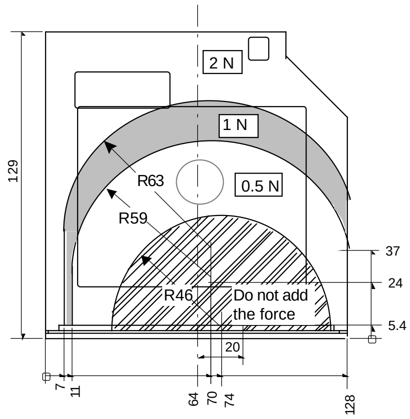
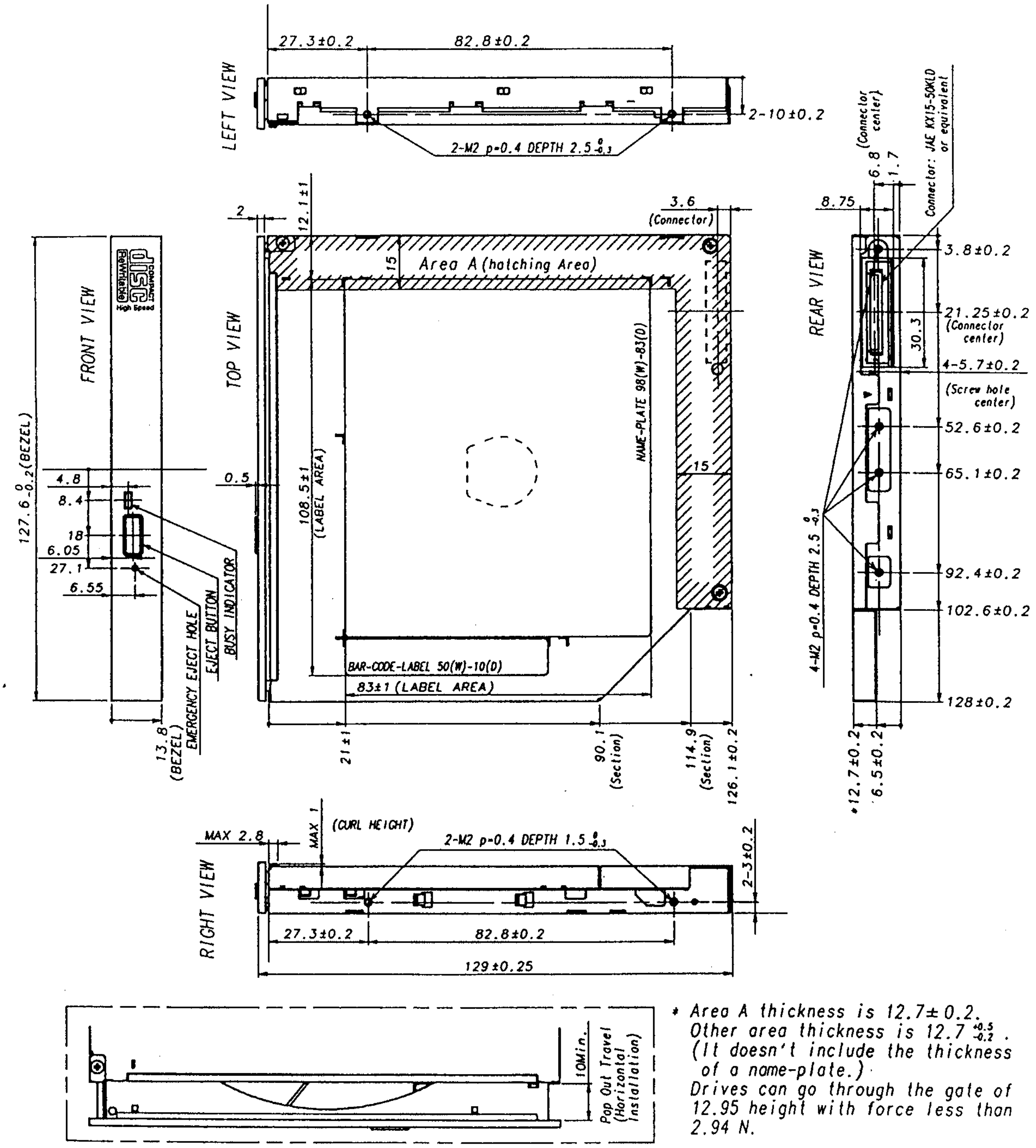


Figure 2 Restricted force range applied for the top cover

(5) The characteristics of EMC (Electro Magnetic Compatibility) are primarily influenced by the mounting method of this equipment. Attach this equipment by considering an appropriate method and structure.

3.4. Dimension and Mass ----- See Figure 3 for details -----

(1) External Dimensions (W x H x D)	128 mm x 12.7 mm x 126.1 mm (excluding bezel)
(2) Mass	0.24 kg (Net) 13.9 kg (Bulk Packaged 50 pcs) 5.7 kg (Bulk Packaged 20 pcs)



* Area A thickness is 12.7± 0.2.
Other area thickness is 12.7 $^{+0.5}_{-0.2}$.
(It doesn't include the thickness of a name-plate.)
Drives can go through the gate of 12.95 height with force less than 2.94 N.

(Unit: mm)

Figure 3 External Dimensions

3.5. Reliabilites

3.5.1. Error Rate

(1) Hard Read Error Rate (Byte Error Rate) -----	Allowing 5 Retries(default) ----- Mode 1:10^{-15} Max Mode 2:10^{-12} Max
(2) Seek Error Rate --- Allowing 10 Retries (default)	10^{-6} Max

3.5.2. MTBF	60,000 h
Assumptions: Power On Hours	5,436 h/year
On/Off Cycles	313 cycles/year
Number of Access	600,000 accesses/year
Operating Duty Cycle (Read)	20 % of Power On Time (Reading/Seeking)
Operating Duty Cycle (Write)	2 % of Power On Time (Writing/Seeking)
3.5.3. MTTR	0.5 h
3.5.4. Drive Life	15,000 h or 5 years (earlier one)
(1) Drawer Load/Release	10,000 times or more
(2) Interface connector Attach/Detach	500 times or more

4. Configuration

See Figure 4 for details of the configurations

4.1. Electrical Circuits

(1) Drawer Release Switch and Release Detection Switch
(2) Optical Pickup Servo Drive Circuit
(3) Feed Motor Drive Circuit
(4) Laser Diode Control Circuit
(5) EFM Demodulator, Error Correction Circuit and DA converter
(6) IDE/ATAPI Control and CD-ROM Error Correction Circuit
(7) CIRC Encoder
(8) EFM Encoder
(9) ATIP Demodulator
(10) Disc Moter Control Circuit

4.2. Optical Pickup	Semiconductor Laser
4.3. Spindle Motor	Brushless DC Motor
4.4. Feed Motor	DC Motor

CD-R / RW DRIVE MODEL SR-C8002 BLOCK DIAGRAM

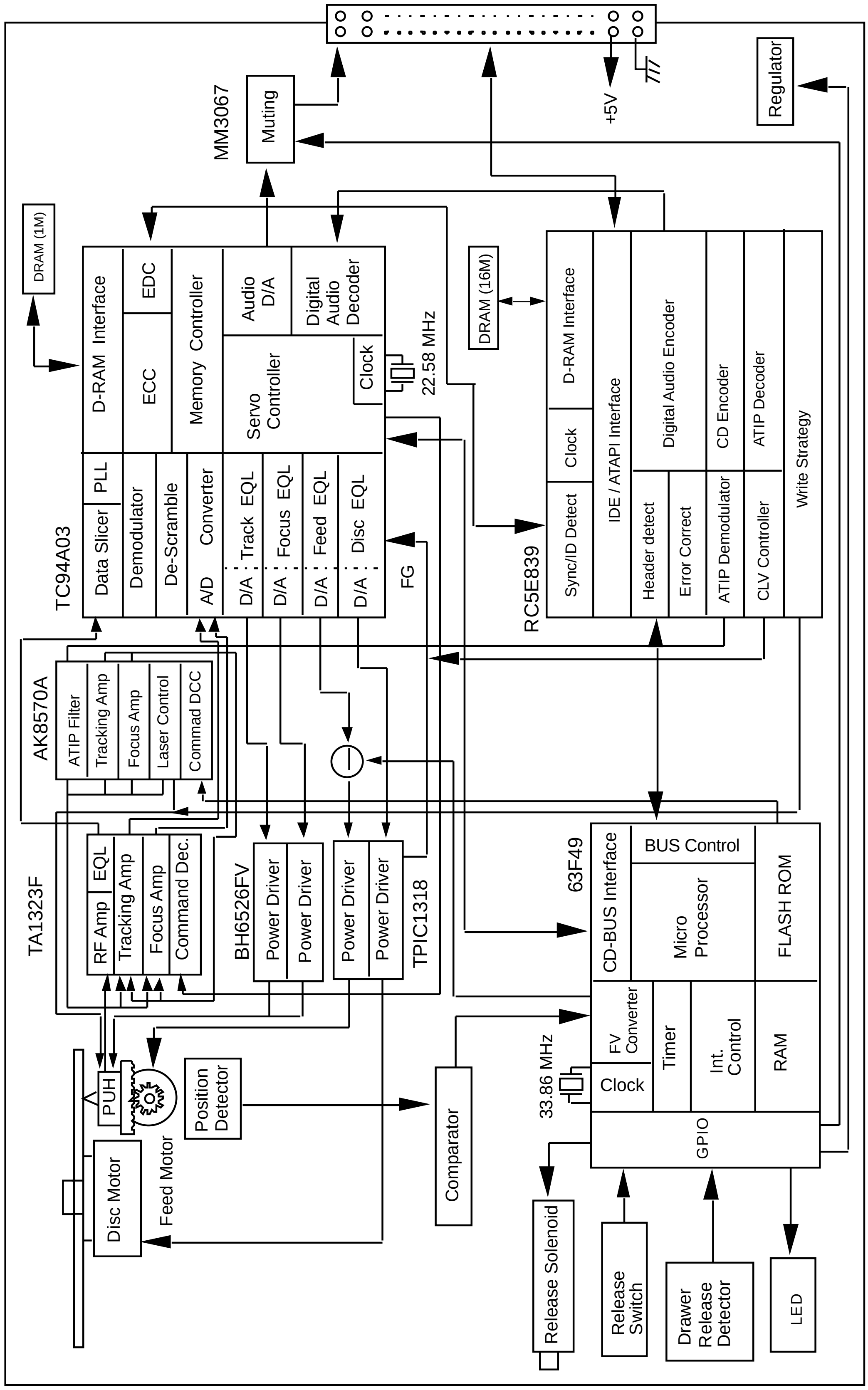


Figure 4 Configuration

5.Functions

5.1. Disc Data Configurations

5.1.1. CD-ROM Data Configurations

Figure 5 shows how the data is structured in program units

1 block=1/75 s

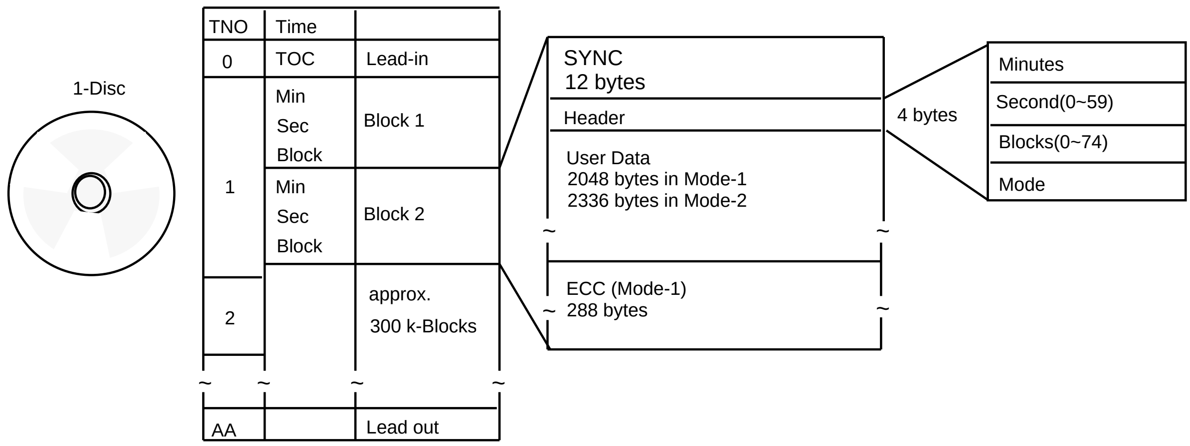


Figure 5 CD-ROM Disc Data Configuration

5.1.2. CD-R / CD-RW Data Configurations

Before writing

CD-R / CD-RW disc contains time-code information called ATIP.

ATIP is abbreviation of "Absolute Time In Pre-groove" in the wobbling groove by modulating the carrier frequency.

(Address information is pre-formatted to ATIP on the CD-R / CD-RW disc and method for the guide groove to wobble by FM modulation.)

Figure 6 shows the composition of ATIP.

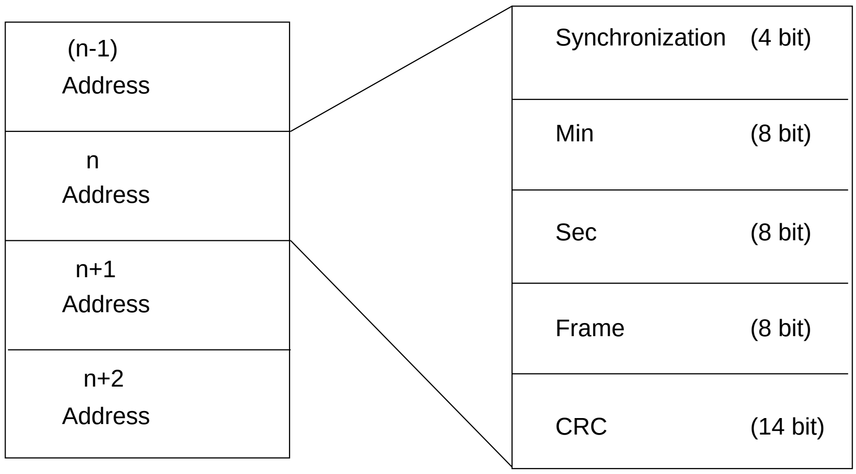


Figure 6 CD-R / CD-RW Disc ATIP Data Configuration

After Writing

Data are written in CD format synchronizing with ATIP.

5.2. Power ON/OFF Timing

Figure 7 shows the initialization sequence

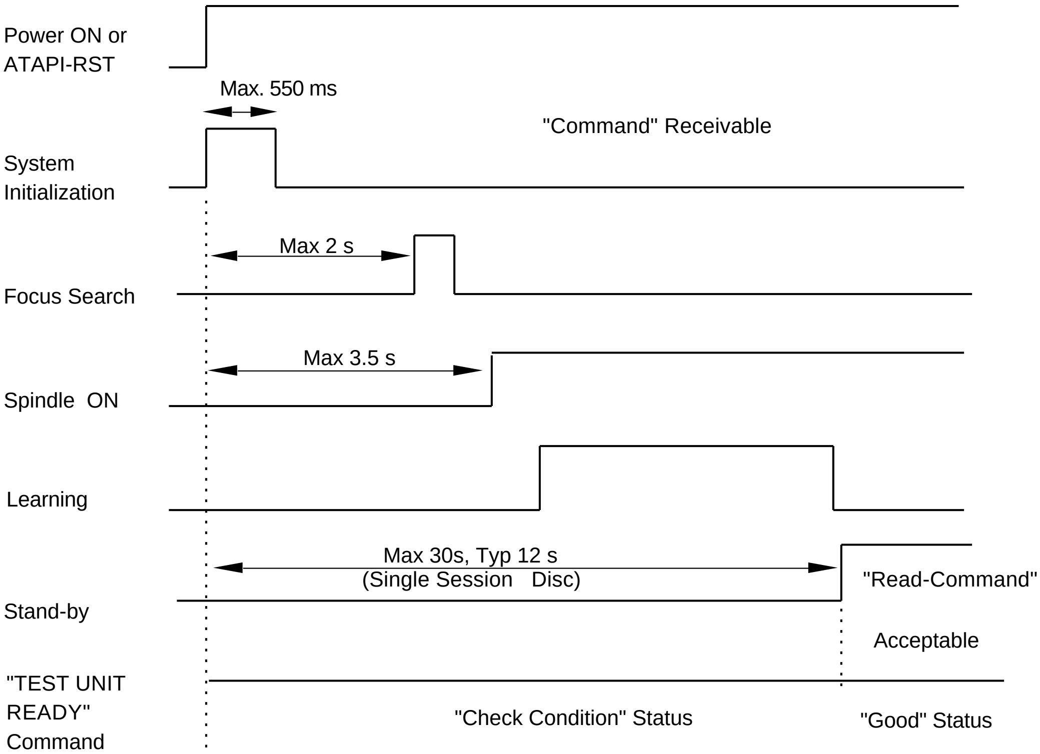


Figure 7 Initialization Sequence

6. Interface

(1) The interface is based on T13/1321D (AT Attachment with Packet Interface-5, ATA/ATAPI-5) Revsion 3 (Feb. 29, 2000), SFF-8020i (Small Form Factor Committee Specification of ATA-Packet Interface for CD-ROMs) Revision2.6 (Nov. 27, 1995), SFF-8090 Ver.3, Rev.1.00 ('99-2-10).

(2) 58 (ATAPI, ATA) commands are usable.

(3) The 2 MByte data buffer handles both high speed and low speed data transmission.

(4) The largest block size on playback is 2,647 Bytes.
The data length for each block is changeable by command.

6.1. I/O cable

Table1 shows the cable parameters.

	Min	Max
Cable length		0.46 m
Driver IoL sink current for 5 V operation	12 mA	
Driver IoL sink current for 3.5 V operation	8 mA	
Driver IoH sink current		-400 μA
Driver capacitive loading		25 pF

Table 1 Cable parameters

6.2.Signal summary

The physical interface consists of single ended TTL compatible receivers and drivers communicating through a 50P-connector as shown in Figure 11 and Figure 12 "Interface connector".

6.2.1. Signal Specification

Figure 8 shows the Signal Specifications

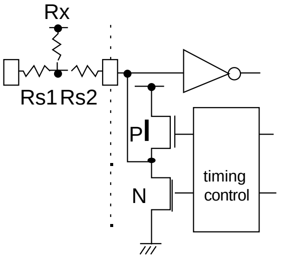
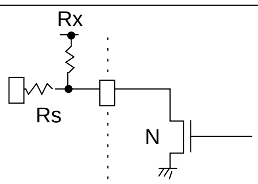
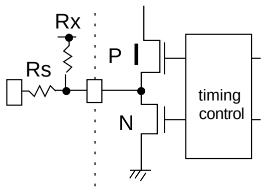
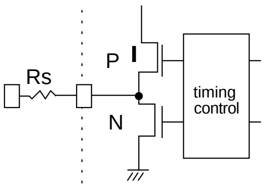
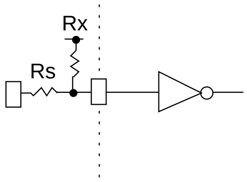
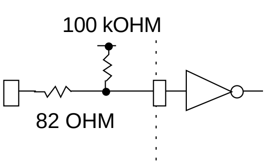
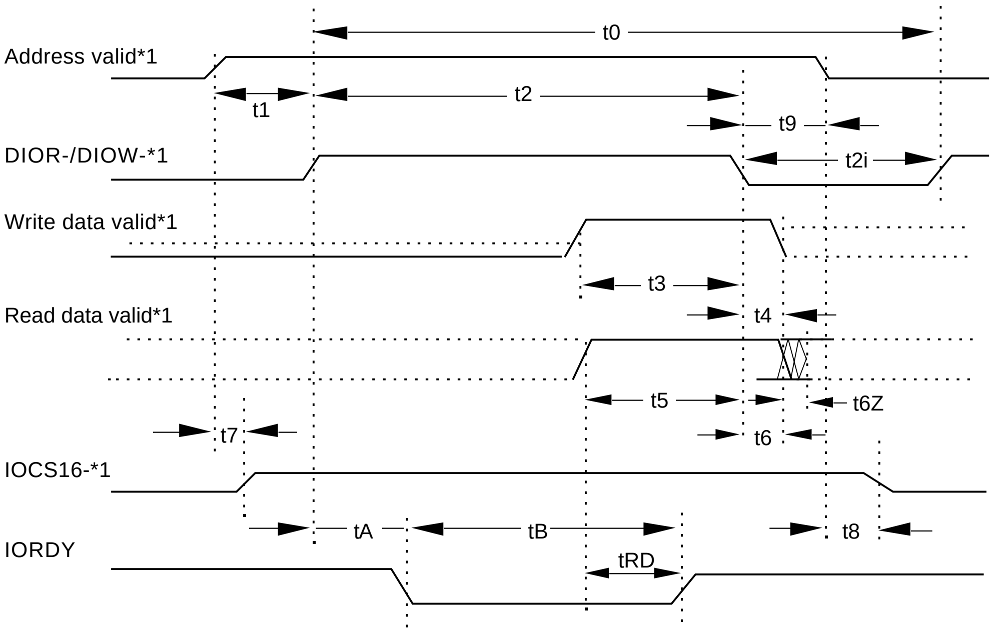
Sig. Name	Type	Receivers/Drivers Caracteristics withoutExternal pullup Resistor					NOTE
				Min	Max	Condition	
HD0 - HD15 /DASP /PDIAG		VOH	Voltage Output High	Vdd-0.4 V		IOH=1 mA	Bidirectional Rx=infinity Rs1=0 OHM Rs2=33 OHM HD0-HD15 Rx=10 kOHM Rs1=0 OHM Rs2=0 OHM /PDIAG, /DASP
		VOL	Voltage Output Low		0.4 V	IOL=12 mA	
		VIH	Input HIGH Voltage	2.4 V		TTL	
		VIL	Input LOW Voltage		0.6 V	TTL	
		ILI	Input leakage Current	-30 µA	-400 µA	Pullup Resistor(Ri)	
		IOL	Driver sink current	24 mA			
		ILO	Output Leakage Current	-30 µA	-400 µA	Pullup Resistor(Ri)	
		CI	Input Capacitance		15 pF		
		CO	Output Capacitance		15 pF		
/IOCS16		VOL	Voltage Output Low		0.5 V	IOL=12 mA	Open Drain Rx=1.2 kOHM Rs=0 OHM
		IOL	Driver sink current	24 mA			
		CO	Output Capacitance		15 pF		
IORDY		VOH	Voltage Output High	2.4 V		IOH=400 µA	Rx=1 kOHM Rs=22 OHM
		VOL	Voltage Output Low		0.5 V	IOL=12 mA	
		IOL	Driver sink current	24 mA			
		CO	Output Capacitance		15 pF		
/HDRQ /INTRQ		VOH	Voltage Output High	Vdd-0.4 V		IOH=400 µA	Rs=22 OHM /INTRQ /HDRQ
		VOL	Voltage Output Low		0.4 V	IOL=12 mA	
		IOL	Driver sink current	24 mA			
		CO	Output Capacitance		15 pF		
/HWR /HRD HA0 - HA2 /HCS1/HCS3 /HDAK		VIH	Input HIGH Voltage	2.0 V		TTL	Rx=infinity Rs=82 OHM /HWR, /HA0-2, /HDAK Rx=infinity Rs=120 OHM /HRD Rx=10 kOHM Rs=82 OHM /HCS1,/HCS3
		VIL	Input LOW Voltage		0.8 V	TTL	
		ILI	Input leakage Current	-30 µA	-400 µA	Pullup Resistor(Ri)	
		CI	Input Capacitance		15 pF		
RESET		VIH	Input HIGH Voltage	2.4 V			
		VIL	Input LOW Voltage		0.6 V		
		ILI	Input leakage Current	-30 µA	-400 µA	Pullup Resistor(Ri)	
		CI	Input Capacitance		15 pF		

Figure 8 Signal Specifications

6.2.2.Timing of Host Interface (PIO)

Figure 9 shows the Host Interface Timings



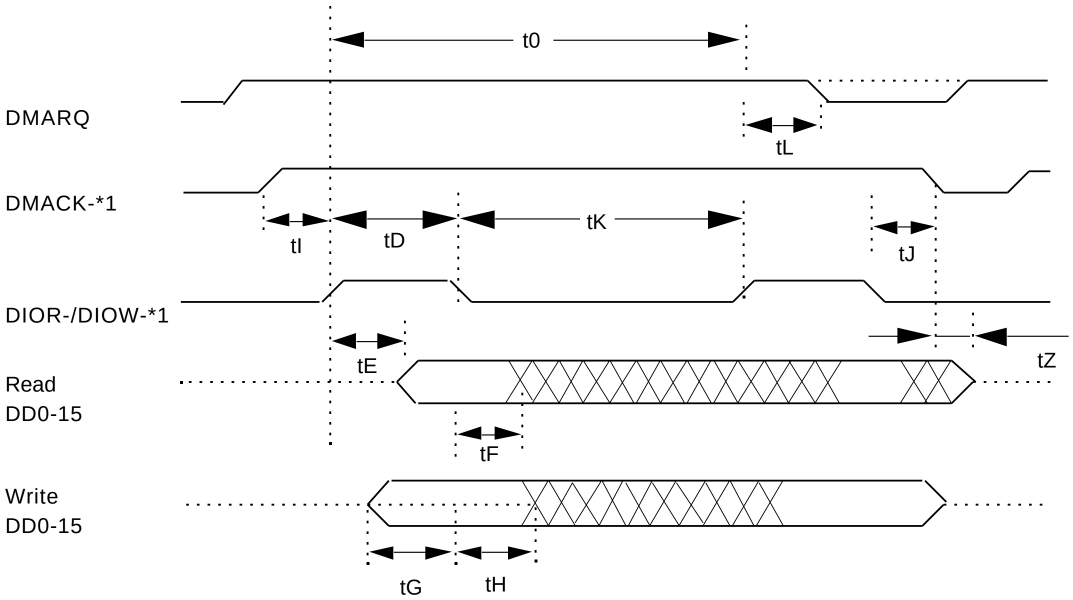
*1: In all timing diagrams, the low line indicator negated, and the upper line indicators asserted.

	PIO timing parameters min (ns) max (ns)	Min Time (ns)	Max Time (ns)
t0	Cycle time	120	
t1	Address valid to DIOR/DIOW-setup	25	
t2	DIOR/DIOW-pulse wide	70	
t2i	DIOR/DIOW-recovery time	25	
t3	DIOW-data setup	20	
t4	DIOW-data hold	10	
t5	DIOR-data setup	20	
t6	DIOR-data hold	5	
t6Z	DIOR-data tristate		30
t7	Addr valid to IOCS 16-assertion		30
t8	Addr valid to IOCS 16-negation		30
t9	DIOR/DIOW-to address valid hold	10	
tRD	Read Data Valid to IORDY active	0	
tA	IORDY setup		35
tB	IORDY pulse wide		1250

Figure 9 Host Interface Timing (PIO Mode4)

6.2.3.Timing of Host Interface (DMA Multi)

Figure 10 shows the Host Interface DMA multi word Timings



*1: In all timing diagrams, the low line indicator negated, and the upper line indicators asserted.

	Multi word DMA timing parameters min(ns) max(ns)	Min time (ns)	Max time (ns)
t0	Cycle time	120	
tC	DMACK to DMREQ delay		---
tD	DIOR-/DIOW-16-bit	70	
tE	DIOR- data access		---
tF	DIOR- data hold	5	
tZ	DMACK- to tristate		25
tG	DIOR/DIOW- data setup	20	
tH	DIOW- data hold	10	
tI	DMACK to DIOR-/DIOW- setup	0	
tJ	DIOR-/DIOW- to DMACK hold	5	
tKr	DIOR- negated pulse width	25	
tKw	DIOW- negated pulse width	25	
tLr	DIOR- to DMREQ delay		35
tLw	DIOR- to DMREQ delay		35

Figure 10 Host Interface Timing (Multi Word DMA Mode 2)

6.3. Connector

Figure 11 shows the connector and Figure 12 shows the interface pin assignments
Use Japan Aviation Electronics Industry Limited KX15-50KLD L or equivalent.
Conformable connector is Japan Aviation Electronics Industry Limited KX14-50 series.

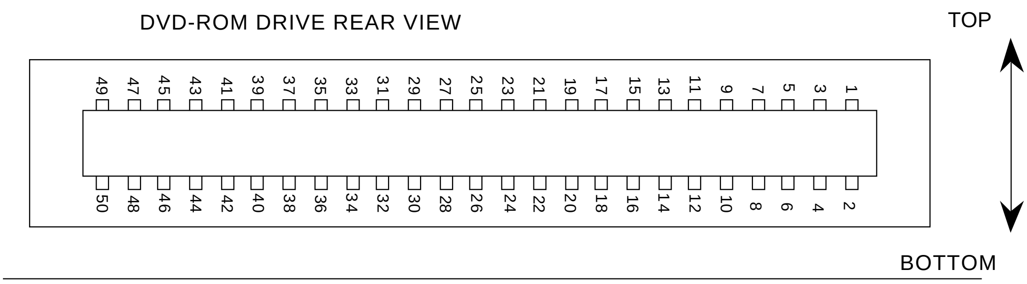


Figure 11 Connector pin assignments

Signal name	I/O	Connector contact		I/O	Signal name
Audio L-CH	O	1	2	O	Audio R-CH
Audio Ground		3	4		Ground
/RESET	I	5	6	I/O	DD8
DD7	I/O	7	8	I/O	DD9
DD6	I/O	9	10	I/O	DD10
DD5	I/O	11	12	I/O	DD11
DD4	I/O	13	14	I/O	DD12
DD3	I/O	15	16	I/O	DD13
DD2	I/O	17	18	I/O	DD14
DD1	I/O	19	20	I/O	DD15
DD0	I/O	21	22	O	DMARQ
Ground		23	24	I	/DIOR: /HDMARDT: HSTROBE
/DIOW :STOP	I	25	26		Ground
IORDY: /DDMARDY: DSTROBE	O	27	28	I	/DMACK
INTRQ	O	29	30	O	/IOCS16
DA1	I	31	32	I/O	/PDIAG
DA0	I	33	34	I	DA2
/CS1FX	I	35	36	I	/CS3FX
/DASP	I/O	37	38	I	+5 V(Motor)
+5 V(Motor)	I	39	40	I	+5 V(Motor)
+5 V(Logic)	I	41	42	I	+5 V(Logic)
Ground		43	44		Ground
Ground		45	46		Ground
CSEL	I	47	48		Ground
Vender unique*	I	49	50	I	Vender unique*

A slash character(/) at the beginning of a signal name indicates it is asserted at the low level (active low).
*Vender unique: Don't Connect (50 PIN)
*Vender unique: 49 PIN

Figure 12 Signal assignments

6.4. Support Command List

ATAPI Packet Command

No	OP Code	Command Description
1	00h	Test Unit Ready
2	01h	Rezero Unit
3	03h	Request Sense
4	04h	Format Unit
5	12h	Inquiry
6	1Bh	Start / Stop Unit
7	1Ch	Receive Diagnostics
8	1Dh	Send Diagnostic
9	1Eh	Prevent / Allow Medium Removal
10	23h	Read Format Capacities
11	25h	Read Capacity
12	28h	Read (10)
13	2Ah	Write (10)
14	2Bh	Seek (10)
15	35h	Synchronize Cache
16	42h	Read Sub-Channel
17	43h	Read TOC / PMA / ATIP
18	44h	Read Header
19	45h	Play Audio (10)
20	46h	Get Configuration
21	47h	Play Audio MSF
22	4Ah	Get Event Status Notification
23	4Bh	Pause / Resume
24	4Eh	Stop Play / Scan
25	51h	Read Disc Information
26	52h	Read Track / RZone Information
27	53h	Reserve Track
28	55h	Mode Select (10)
29	5Ah	Mode Sense (10)
30	5Bh	Close Track / Session
31	5Ch	Read Buffer Capacity
32	5Dh	Send Cue Sheet
33	A1h	Blank
34	A2h	Send Event
35	A5h	Play Audio (12)
36	A7h	Set Read Ahead
37	A8h	Read (12)
38	ACh	Get Performance
39	B6h	Set Streaming
40	B9h	Read CD MSF
41	BAh	SCAN
42	BBh	Set CD Speed
43	BDh	Mechanism Status
44	BEh	Read CD

ATA Command for ATAPI

No.	OP Code	Command Description
-	00h	Nop
1	08h	ATAPI Soft Reset
2	20/21h	Read Sector (s)
3	90h	Execute Drive Diagnostics
4	A0h	ATAPI Packet Command
5	A1h	ATAPI Identify Device
6	E0h	Standby Immediate
7	E1h	Idle Immediate
8	E2h	Standby
9	E3h	Idle
10	E5h	Check Power Mode
11	E6h	Sleep
12	E7h	Flush Cache
13	ECh	ATA Identify Device
14	EFh	Set Feature

7. Power Requirements

7.1. Source Voltage — +5 V +/-5 % (Operating)
+5 V +/-8 % (Start up)

7.1.1. Spike — 100 mV (p-p) Max.

7.1.2. Ripple — 100 mV (p-p) Max.

7.2. Current Drain (Typical value) — +5 V

7.2.1.Sleep — 40 mA

7.2.2.Standby (Laser off, Motor off) — 70 mA

7.2.3. Continuous Read (Data/Audio) — 620 mA (4-6X)
900 mA (10.3-24X)

7.2.4.Idle (Laser on, Motor on) — 600 mA (10.3-24X)

7.2.5. Average (20% Random Access) — 900 mA (10.3-24X)

7.2.6. Maximum (100% Random Access) — 950 mA (10.3-24X)

7.2.7. Peak in executing Access — 1,650 mA
(Exclude Spike Current)
*Spike: Less than 1 ms of duration

7.2.8. Write — 760 mA (CD-R/RW)
820 mA (High Speed CD-RW)

8.CD Audio (Test condition: Ordinary temperature)

8.1. Analog Out --- in case of the attenuator is set at 0 dB by the command ---

(1) Output Level	0.8 V (rms)+/-1 dB
(2) Type	Unbalanced
(3) Load Impedance	47 kOHM min
(4) Frequency Response	20 Hz to 20 kHz+/-3.0 dB. (at 47 kOHM Load)
(5) Distortion	0.04 % Max. (at 1 kHz w/20 kHz LPF)
(6) Signal to Noise Ratio	80dB Typ (IEC179 A-Weighted)

8.2. Audio Modes

(1) 16 Modes including 'Stereo', 'Lch Mono', 'Rch Mono' and 'Mute' are selectable by command.
Default mode is 'Stereo'.

(2) 16 Steps of attenuation level for the Audio Output is selectable by command.
Default level is 0 dB.

9. Device Configuration Jumper

9.1. Master Mode Setting
Short-circuit the PIN 47 and PIN 48 of I/O connectors.

9.2.Slave Mode Setting
Open the PIN 47 of I/O connectors.

(Optional)

9.1. Master Mode Setting
Open the PIN 47 of I/O connectors.

9.2. Slave Mode Setting
Short-circuit the PIN 47 and PIN 48 of I/O connectors.

10. Busy Indicator

The LED at Front Bezel (Busy Indicator) indicates the drive status.

Color: AMBER

(1) After Drawer is closed, Busy Indicator start blinking at 0.8 s intervals, and then -----

(1-1) Turns off when the drive in the 'Idle' status.

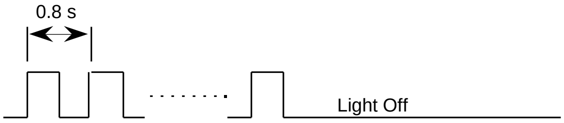


Figure 13 Idle

(1-2) Continuously off when no disc is mounted.

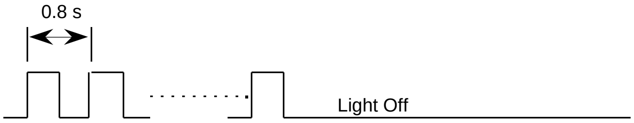


Figure 14 No disc

(1-4) Continuously on when media has problem

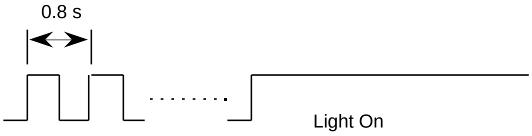
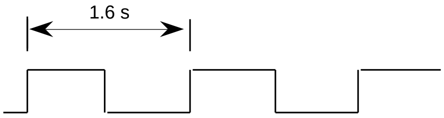


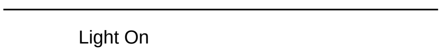
Figure 15 Media Problem

(2) When playing an audio track, Busy Indicator is blinking at 1.6 s intervals.



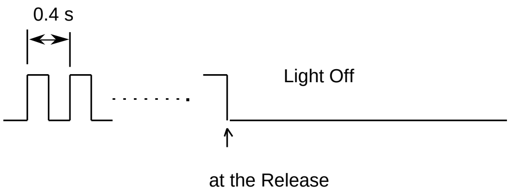
Figurer 16 CD-Audio playback

(3) When performing 'Data Access' and during 'Data Transfer' and 'write' Busy Indicator keeps turn On.



Figurer 17 Data Access and Data Transfer

(4) When pushing Release button, Busy indicator is blinking at 0.4 s intervals.



Figurer 18 Release

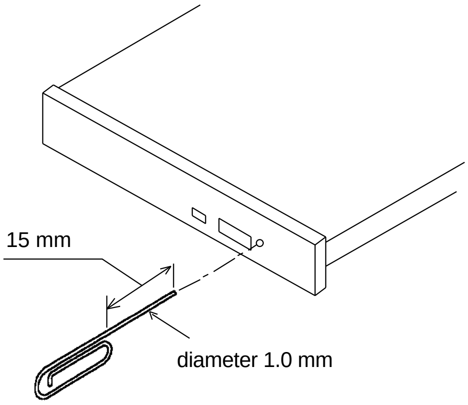
11.Emergency Release

Execute following procedure only in the case of emergency (Drawer will not release and disc can not be removed although pressing Release Button).

(1) Turn the drive supplying power off.

(2) Insert solid bar (like paper clip) into Emergency Release hole and push as shown in Fig.19. Then Drawer will be released.

(3) After removed the disc, gently push Drawer to close.



Figurer 19 Emergency Release

12.Safety Standards/Agency Approvals (TENTATIVE)

(1) Safety	EN60950	
	UL 1950	
	CAN/CSA-22.2 No.950	
(2) Laser	FDA 21CFR (U.S.A./DHHS)	
	EN60825-1 (Europe)	
(3) EMC	CE	
	EN55022	: 1998 [Radio disturbance characteristics-IT equipment Class B (including domestic environment
	EN55024 (EMS)	: 1998 [Information Technology equipment-Immunity characteristices Limits and methods of masurement]
	IEC61000-4-2+A1	: 1995+1998 [CD:4 kV, ID: 4 kV, AD:8 kV]
	IEC61000-4-3	: 1996 [3 V/m, 80-1000 MHz, 1 kHz 80 % AM]
	IEC61000-4-4	: 1995 [AC-line: 1 kV, I/F 0.5 kV f: 5 kHz, Polarity: +/-]
	IEC61000-4-5	: 1995 [AC-line: 2 kV/1 kV, Polarity: +/-]
	IEC61000-4-6	: 1996 [3 V, 0.15-80 MHz, 80 % AM]
	IEC61000-4-8	: 1993 [1 A/m, 50 Hz]
	IEC61000-4-11	: 1994 [>95 % 0.5, 30% 25, >95 250]
	KOREAN EMC No. 13237	
	TAIWAN EMI CNS 13438	

13. Electrostatic Discharge

Standard	IEC61000-4-2
(1) Operating	8 kV or less
(2) Damage including	15 kV or more

14. Accessories

None

15. Packaging

(1) 50 units in a bulk package	24 bulk packs on one pallet. * All transportation is allowed with pallet. (Transportation with bulk package is not allowed.)
(2) 20 units in a bulk package	24 bulk packs on one pallet. (Transportation with bulk package is allowed.)
(3) 1 unit in a bulk package	(Transporttation with bulk package is allowed.)

16. CE Declaration of conformity

Please refer to attached Annex 1.

TOSHIBA **TOSHIBA EUROPE GMBH**

EU-Declaration of Conformity

Product:	CD-R/RW Drive
Manufacturer(s):	Toshiba Corporation 1-1, Shibaura 1-chome, Minato-ku, Tokyo 105-8001 Japan See page 2 for other locations
Model:	SR-C8002
Options:	None

Toshiba declares that the above mentioned product(s) with or without the listed options comply to the EU-Directives and standards as listed on page 2.

Last two digits of the year in which the CE mark affixed : 01

Responsible for CE-marking:	Toshiba Europe GmbH
Signed by:	Mr. K.Hachisu, President of Toshiba Europe GmbH
Place:	D-41460 Neuss
Date:	April 19, 2001
Signature:	--

This declaration certifies compliance with the listed directives, but does not constitute an assurance of characteristics.
The safety information in the supplied product documentation must be observed.

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[History if issue]	Issued	: Apr. 12, 2001	
	Revision A	:	Ref.:
	Revision B	:	Ref.:
	Revision C	:	Ref.:
	Revision D	:	Ref.:

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Annex 1

EU-Declaration of Conformity

ED-Directive	Related Standard		Issude	Level/Test condition
899/336/EEC (EMC Directive)	EMC-emission:	EN55022	1998	Radio disturbance characteristics-IT equipment Class B (including domestic environment)
	EMC-immunity	EN55024	1998	Information Technology equipment-Immunity characteristices Limits and methods of masurement
		IEC61000-4-2+A1	1995 +1998	CD: 4 kV, ID: 4 kV, AD: 8 kV
		IEC61000-4-3	1996	3 V/m, 80-1000 MHz, 1 kHz 80 % AM
		IEC61000-4-4	1995	AC-line: 1 kV, I/F 0.5 kV f: 5 kHz, Polarity: +/-
		IEC61000-4-5	1995	AC-line: 2 kV/1 kV, Polarity: +/-
		IEC61000-4-6	1996	3 V, 0.15-80 MHz, 80 % AM
		IEC61000-4-8	1993	1 A/m, 50 Hz
		IEC61000-4-11	1994	>95 % 0.5, 30% 25, >95 250

Product/Options	Model	Related EU-Directive 89/336/EEC	
CD-R/RW Drive	SR-C8002	X	

Manufactuer(s) Location	Address
Toshiba Multi Media Devices Co, Ltd	19 Minase, Fukihata Goshogawara-shi, Aomori 037-0003 Japan
Toshiba Misawa Media Devices Co, Ltd	3-31-2779, Minami-cho, Misawa-shi, Aomori-ken 033-0036 Japan
EMS Corp.	4-5 Shoubu, Ubayachi Goshogawara-shi, Aomori 037-0015 Japan
Hokuto Communication Industrial Co., Ltd.	207 Aza Koamon, Rokugo, Rokugo-machi, Senboku-gun, Akita 019-1404 Japan
Yuzawa Denshi Kogyo Co., Ltd.	257 Nakano Yuzawa-shi, Akita 012-0041 Japan
Tsugaru Technica Co., Ltd.	81-87 Iwai, Aiuchi, Shiura-machi, Kitatsugaru-gun, Aomori, 037-0401 Japan
Emusu Itayanagi Co., Ltd.	13-10, Matsumoto, Tsuji, Itayanagi, Kita-Tyugaru-gun, Aomori, 038-3645 Japan
Toshiba Information Equipment (Philippines) Inc	103 East Main Avenue Extension, Special Export Processing Zone, Laguna Technopark, Binan, Laguna Philippines
Integrated Microelectronic Inc.	North Science Avenue Laguna Techno Park Inc. Binan, Laguna Philippines
EMS Kizukuri Corp.	1-2 Aza-Miyazaki, Kizukuri-machi, Nishi-Tugaru-gun Aomori 038-3157 Japan
EMS Fukaura Co., Ltd	24-1 Aza Azumazawa, Ohaza Fukaura, Fukaura-machi, Nishi-Tsugaru-gun, Aomori, 037-0401 Japan

Document No.: **YEA-R2597** **Revision:**

Page: **2 of 2**

Deviation List

Page	Item	Rev # 0.5	Rev # 1.0
1	2. Features	This drive is a new generation..... .....such as 95 ms access Time.	This drive is a new generation..... .....such as 120 ms access Time.
2	3.1.Performance		
	(5) Rotational Speed		
	Read: ROM Data Media	Approx. 5,100 rpm (10.3-24X CLV)	Approx. 5,100 rpm (10.3-24X CAV)
	CD-DA, Video-CD	Approx. 1,200-2,000 rpm (4-5.7X PCAV)	Approx. 1,290-2,000 rpm (4-6X PCAV)
	CD-RW	TBD (Target Max 10X PCAV)	Approx. 1,290-2,000 rpm (4-6X PCAV)
	Hight Speed CD-RW	-----	Approx. 2,570-4,000 rpm (8-12X PCAV)
	Write: CD-R, CD-RW	Write: CD-R, CD-RW : Approx. 850-1.980 rpm (4X CLV)	Write: CD-R, High spped CD-RW CD-RW: Approx. 850-1.980 rpm (4X CLV) (Add CD-RW)
	Write: CD-R, CD-RW	: TBD (2X CLV)	Delete the : TBD (2X CLV)
3	(6) Transfer Rate		
	Sustained Block Transfer Rate	300-428 Block/s (4-5.7X PCAV)	300-450 Block/s (4-6X PCAV)
	Sustained Data Transfer Rate		
	Mode-1:	4X-5.7X PCAV 600-855 KByte/s	4X-6X PCAV 600-900 KByte/s
	Mode-2:	4X-5.7X PACV 684.4-975.3 KByte/s	4X-6X PACV 684.4-1,026.6 KByte/s
	(8) Spin up Time	TBD s Typ	2.0 s Typ
4	3.2.1.Temperature and Humidity		
	(1) Operating Temperature	5 °C to 45 °C	5 °C to 50 °C
	Note	----- *1: Packed in Toshiba original.....	*1: Except for disc *2: Packed in Toshiba original .....
5	3.2.5.Shock		
	(3) Non-operating	-----	980 m/s^2 [100 G] (Half sine wave 3 ms)
6	3.3.2.Installation	(3) Care should be especially..... does not exceed 45 °C.	(3) Care should be especially..... does not exceed 50 °C.
7	(2) Mass	TBD kg (Net) TBD kg (Bulk Packaged 50 pcs) TBD kg (Bulk Packaged 20 pcs)	0.24 kg (Net) 13.9 kg (Bulk Packaged 50 pcs) 5.7 kg (Bulk Packaged 20 pcs)
8	Figure 3	-----	All of change

Page	Item		Rev # 0.5	Rev # 1.0
12	Figure 7	Focus Search	TBD	Max 2 s
		Spindle ON	TBD	Max 3.5 s
		Stand-by	TBD	Max 30 s Typ 12 s
	6. Interface		(1) The interface is based on X3T13/D96153 Revsion 18.....	(1) The interface is based on T13/1321D (AT Attachment with Packet Interface-5,
			(2) 64	(2) 58
17	6.4. Support Command List ATAPI Packet Command			Delete the No.22 and No.39
18	7.2. Current Drain			
	7.2.1.Sleep		TBD mA	40 mA
	7.2.2.Standby		TBD mA	70 mA
	7.2.3. Continuous Read		TBD mA (4-5.7X)	620 mA (4-6X)
			TBD mA (10.3-24X)	900 mA (10.3-24X)
	7.2.4.Idle		TBD mA (10.3-24X)	600 mA (10.3-24X)
	7.2.5. Average		TBD mA (10.3-24X)	900 mA (10.3-24X)
	7.2.6. Maximum		TBD mA (10.3-24X)	950 mA (10.3-24X)
	7.2.7. Peak in executing Access		TBD mA	1,650 mA
	7.2.8. Write		TBD mA (CD-R/RW)	760 mA (CD-R/RW)
			TBD mA (High Speed CD-RW)	820 mA (High Speed CD-RW)
22	16. CE Declaration of conformity			Delete the TBD